What is claimed is:

1. A mechanical-electrical power conversion system comprising:

a power shaft configured to rotate about an axis;

a transducer comprising an active area, which includes at least a portion of an electroactive polymer and at least two active area electrodes coupled to the portion of the electroactive polymer, wherein the electroactive polymer includes pre-strain; and

a clutch for transmitting mechanical energy between said transducer and said power shaft, said clutch operably coupled to said power shaft and said transducer in a manner allowing engagement and disengagement of the power shaft to the transducer.

2. The system of claim 1 further comprising a rack coupled to the transducer, the rack operably meshing with a pinion attached to said clutch.

3. The system of claim 1 wherein the transducer is configured to engage the clutch during actuation of the active area and disengage the clutch during elastic return of the portion of the electroactive polymer.

4. The system of claim 1 further comprising a second transducer, the second transducer including a second electroactive polymer having a first active area, the first active area of the second electroactive polymer comprising at least two first active area electrodes coupled to the second electroactive polymer and a first portion of the second electroactive polymer.

5. The system of claim 4 wherein the first transducer is configured to rotate the power shaft while the second transducer is elastically contracting.

6. The system of claim 1 wherein the transducer is capable of a first deflection that rotates said power shaft and a second deflection that rotates said power shaft, wherein the second deflection is greater than said first deflection.

7. The system of claim 1 wherein the transducer is configured to operate in resonance.

8. The system of claim 1 further comprising a mechanism that assists rotation of the power shaft.

9. The system of claim 8 wherein the mechanism is a flywheel.

10. The system of claim 1 wherein said power shaft includes a stall position that is maintained with substantially no electrical current to said first active area electrodes.

11. The system of claim 1 wherein said transducer is included in an actuator.

12. A mechanical-electrical power conversion system comprising:

a power shaft configured to rotate about an axis;

a first transducer comprising an active area, which includes at least a portion of a first electroactive polymer and at least two active area electrodes coupled to the portion of the first electroactive polymer;

a first clutch for transmitting mechanical energy between said first transducer and said power shaft, said first clutch operably coupled to said power shaft and said first transducer in a manner allowing engagement and disengagement of said power shaft to said first transducer;

a second transducer comprising an active area, which includes at least a portion of a second electroactive polymer and at least two active area electrodes coupled to the portion of the second electroactive polymer; and

a second clutch for transmitting mechanical energy between said second transducer and said power shaft, said second clutch operably coupled to said power shaft and said second transducer in a manner allowing engagement and disengagement of said power shaft to said second transducer.

13. The system of claim 12 wherein the first transducer is configured to actuate out of phase from actuation of the second transducer.

14. The system of claim 13 wherein the first transducer is configured to rotate the power shaft while the second electroactive polymer is elastically contracting.

15. The system of claim 12 wherein the first transducer is configured to engage the first clutch while the second clutch is disengaged.

16. The system of claim 12 further comprising a rack coupled to said first transducer, the rack operably coupled to a pinion attached to said first clutch.

17. The system of claim 12 wherein said power shaft includes a stall position that is maintained with substantially no electrical current to said at least two active area electrodes coupled to the portion of the first electroactive polymer and said at least two active area electrodes coupled to the portion of the second electroactive polymer.

18. The transducer of claim 12 wherein the first electroactive polymer is elastically pre-strained.

19. The system of claim 12 further comprising a first cable coupled to the first transducer, frictionally coupled to a circumferential portion of the first clutch, and coupled to the second transducer.

20. The system of claim 19 further comprising a second cable coupled to the first transducer, frictionally coupled to a circumferential portion of the second clutch, and coupled to the second transducer.

21. The system of claim 12 wherein the first clutch and the second clutch engage said power shaft in the same direction of rotation about said axis.

22. A mechanical-electrical power conversion system comprising:

a power shaft configured to rotate about an axis;

a transducer comprising an active area, which includes at least a portion of an electroactive polymer and at least two active area electrodes coupled to the portion of the electroactive polymer;

a first clutch for transmitting mechanical energy between said transducer and said power shaft, said first clutch operably coupled to said power shaft and said transducer in a manner allowing engagement and disengagement of said power shaft to said transducer, said engagement of said first clutch producing rotation of said power shaft in a first direction about said axis for a first direction of deflection of said transducer; and

a second clutch for transmitting mechanical energy between said transducer and said power shaft, said second clutch operably coupled to said power shaft and said transducer in a manner allowing engagement and disengagement of said power shaft to said transducer, said engagement of said second clutch producing rotation of said power shaft in said first direction about said axis for a second direction of deflection of said transducer.

23. The system of claim 22 wherein said first direction of deflection of said transducer and said second direction of deflection of said transducer are linearly opposite directions.

24. The system of claim 22 wherein said transducer is a monolithic transducer comprising a second active area, the second active area having at least two second active area electrodes coupled to a second portion of the electroactive polymer.

25. The system of claim 24 wherein the first active area is configured to rotate the power shaft while the second active area is elastically contracting.

26. The system of claim 24 wherein the transducer is configured to operate in resonance.

27. The system of claim 22 wherein the transducer is capable of a first deflection that rotates said power shaft and a second deflection that rotates said power shaft, wherein the second deflection is greater than said first deflection.

28. A mechanical-electrical power conversion system comprising:

a power shaft configured to rotate about an axis;

a transducer comprising a first active area and a second active area, the first active area having at least two first active area electrodes and a first portion of the electroactive polymer arranged in a manner which causes the first portion to deflect in response to a

change in electric field provided by the at least two first active area electrodes, the second active area having at least two second active area electrodes and a second portion of the electroactive polymer arranged in a manner which causes the second portion to deflect in response to a change in electric field provided by the at least two second active area electrodes; and

a clutch for transmitting mechanical energy between said transducer and said power shaft, said clutch operably coupled to said power shaft and said transducer in a manner allowing engagement and disengagement of the power shaft to the transducer.

29. The system of claim 28 wherein the electroactive polymer includes pre-strain.

30. The system of claim 28 wherein the first and second active areas are arranged such that deflection of the first portion includes a direction of contraction that is at least partially linearly aligned with a direction of expansion for the second portion.

31. The system of claim 28 wherein the electroactive polymer is a dielectric elastomer.

32. A device for converting between electrical energy and mechanical energy, the device comprising:

at least one transducer, each transducer comprising:

at least two electrodes, and

a polymer arranged in a manner which causes a first portion of the polymer to deflect in the first direction in response to a change in electric field and/or arranged in a manner which causes a change in electric field in response to deflection of the polymer in the first direction;

a first substantially rigid member attached to a second portion of the polymer;

a second substantially rigid member attached to a third portion of the polymer, the second portion and the third portion arranged to increase in distance therebetween upon deflection of the first portion; and

a first flexure coupled to the first and second members, wherein the first flexure improves torsional stiffness for the device.

33. The device of claim 32 further including a second flexure coupled to the first and second members, wherein the second flexure improves torsional stiffness for the device.

34. The device of claim 32 wherein the first and second substantially rigid members are attached to substantially parallel edges of the polymer and prevent deflection of the polymer in a direction substantially parallel to the substantially parallel edges.

35. The device of claim 32 wherein the first flexure comprises a first flexure member mechanically coupled to a second flexure member, the first flexure member coupled to the first substantially rigid member and the second flexure member coupled to the second substantially rigid member.

36. The device of claim 32 wherein the polymer has an aspect ratio greater than 4:1.

37. The device of claim 32 wherein the first flexure improves torsional stiffness for the device about the plane of the polymer.